

# STRUCTURE OF A UNIFORM THERMAL CONDUCTIVE HEAT DISSIPATION DEVICE

## BACKGROUND OF THE INVENTION

The present invention relates in general to an improved structure of a uniform thermal conductive heat dissipation device, and more particular, to a heat dissipation device of which the heat pipes are embedded in the thermal conductor to result in uniform thermal conduction and heat dissipation.

In the old computer design, the operation speed of central processing unit (CPU) is so slow that an aluminum extrusion type or fin-type heat sink will be sufficient to dissipate the heat generated by the central processing unit. However, as the clock of central processing unit has exceeded 1GHz or even reached 3GHz, the heat generated by the central processing unit increases proportionally to the operation speed. However, due to the limited space within the housing, the conventional heat dissipation device can hardly provide effective heat dissipation. It has thus become a critical problem to be resolved in computer industry.

Figure 1 shows a conventional heat dissipation device. As shown, the heat dissipation device includes a thermal conductive plate 10a, a plurality of heat pipes 20a and a heat sink 30a. The thermal conductive plate 10a has a planar body member attached to a heat generating device such as a central processing unit. The top surface of the thermal conductive plate 10a is opened to form a plurality of parallel channels 11a allowing the heat pipes 11a to be embedded therein. Each of the heat pipes 11a includes a wick structure and a work fluid therein. The top end of each heat pipe 11a includes a heat dissipation portion, while the bottom end of each heat pipe 11a includes a heat absorbing portion in abutting contact with the thermal conductor 10a. The heat dissipation portion is in contact with the heat sink 30a to form the heat dissipation device. Thereby, the heat generated by the heat dissipation device can be guided to the

thermal conductive plate 10a, and further dissipated from the heat sink 30a via the heat pipes 20a.

However, the conventional heat dissipation device as disclosed above has the following drawbacks. As the dimension of the heat generating device such as the central processing unit shrinks, the heat generated thereby is very concentrated. Therefore, the heat pipes 20a closest to the heat generating device can absorb the heat and vaporize the working fluid therein instantly. Thereby, the heat can be conducted to the heat dissipation portion efficiently. However, as the heat sink 30a cannot dissipate the heat away efficiently, such heat reflows back to the heat pipes 20a. As a result, the work fluid cannot be condensed quick enough to absorb further heat. The thermal conduction mechanism by phase transition between liquid state and gas state of the heat pipes 20a is thus degraded. Further, the heat pipes 20a at two sides are relatively remote to the heat generating device. Therefore, the propagation path of heat is too long, and the heat pipes 20 cannot absorb the heat efficiently.

## BRIEF SUMMARY OF THE INVENTION

The present invention provides an improved structure of a uniform thermal conductive heat dissipation device, of which heat pipes are embedded in a thermal conductor, and propagation path of heat has been so arranged that the distance between the heat source and each heat pipe is the same. Therefore, a uniform thermal conduction and heat dissipation effect is obtained.

The uniform thermal conductive heat dissipation device provided by the present invention includes a thermal conductor and a plurality of heat pipes. The thermal conductor includes a convex member, on which a plurality of parallel connecting parts is formed. The heat pipes are embedded in the connecting parts. Each of the heat pipes includes a wick structure and a working fluid therein. In addition, each of the heat pipes is partitioned into a

heat absorbing portion and a heat dissipation portion. The heat absorbing portion is in abutting contact with the thermal conductor.

These and other objectives of the present invention will become obvious to those of ordinary skill in the art after reading the following detailed  
5 description of preferred embodiments.

It is to be understood that both the foregoing general description and the following detailed description are exemplary, and are intended to provide further explanation of the invention as claimed.

### BRIEF DESCRIPTION OF THE DRAWINGS

10 These, as well as other features of the present invention, will become apparent upon reference to the drawings wherein:

Figure 1 shows a conventional heat dissipation device;

Figure 2 shows an exploded view of a heat dissipation device provided in a first embodiment of the present invention;

15 Figure 3 shows a perspective view of the heat dissipation device as shown in Figure 1;

Figure 4 shows a cross sectional view of the heat dissipation device as shown in Figure 1;

20 Figure 5 shows a cross sectional view of a heat dissipation device provided in a second embodiment of the present invention;

Figure 6 shows a perspective view of a heat dissipation device provided in a third embodiment of the present invention; and

Figure 7 shows a perspective view of a heat dissipation device provided in a fourth embodiment of the present invention.

### 25 DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to the preferred embodiments of the present invention, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers are used in the drawings and the description to refer to the same or like parts.

5 Referring to Figures 2-4, an exploded view, a perspective view, and a cross-sectional view of a first embodiment of a heat dissipation device are illustrated. The heat dissipation device includes a thermal conductor 10 and a plurality of heat pipes 20.

The thermal conductor 10 is fabricated from material with good thermal  
10 conductivity such as copper, for example. The thermal conductor 10 includes a convex body member 11. The convex body member 11 has a semi-circular, trapezium (as shown in Figure 5), or other geometric cross section. In the current embodiment, the body member 11 has a semi-circular cross section. The curve surface of the body member 11 is processed to form a plurality of  
15 parallel connecting parts 12. The connecting parts 12 are in the form of elongate trenches or channels.

Each of the heat pipes 20 includes an elongate or U-shape circular tube, in which the wick structure and working fluid are introduced. By the thermal conductive mechanism of the wick structure and the gas-liquid phase transition  
20 of the working fluid, the generated heat can be quickly dissipated. The heat pipe 20 further includes a heat absorbing portion 21 and a heat dissipation portion 22. The heat absorbing portion 21 is conformal to the connection portions 12 of the thermal conductor 10, such that an abutting contact can be obtained.

25 Therefore, the heat pipes 20 can be uniformly embedded in the curved surface of the thermal conductor 20. According to the heat propagation path, the heat pipes 20 are subject to the same amount of heat to obtain a uniform heat dissipation effect.

The heat dissipation device may further comprise a heat sink 30 mounted to the heat pipes 20. The heat sink 30 may includes a stack of fins 31. The fins are fabricated from materials with good conductivity such as aluminum or copper. The bottom of the heat sink 30 is recessed to form a receiving window  
5 32 conformal to the body member 11 of the thermal conductor 10. On the surface of the receiving window 32, a plurality of connecting structures 33 is formed to receive the heat dissipation portions 22 of the heat pipes 20.

Referring to Figures 6 and 7, third and fourth embodiments of the present invention are illustrated. As shown, the connection parts 12 thermal conductor  
10 10 are in the form of elongate circular channels, and the connecting structures 33 are also in the form of elongate circular channels. Thereby, the heat absorbing portions 21 and heat dissipation portions 22 of the heat pipes can be connected thereto. The structure as disclosed increase the contact area between the heat pipes 20, the thermal conductor 10 and the heat sink 30 (as shown in  
15 Figure 6). Further, the surface area for heat dissipation of the heat sink 30 is also enlarged to enhance the overall heat dissipation efficiency.

Therefore, the present invention provides at least the following advantages.

1. The convex body member provides the heat propagation paths along which the heat pipes are subject to the same amount of heat. As a result, a  
20 uniform thermal conduction and heat dissipation effect is obtained.

2. The heat pipes have high thermal conduction with fast-responding and low-resistant features, such that the heat can be guided and dissipated away instantly to prevent the computer from being down or operating at an abnormal temperature.

25 3. The heat pipes are embedded in the thermal conductor or the heat sink, such that the heat dissipation is enhanced.

This disclosure provides exemplary embodiments of the present invention. The scope of this disclosure is not limited by these exemplary embodiments.

Numerous variations, whether explicitly provided for by the specification or implied by the specification, such as variations in shape, structure, dimension, type of material or manufacturing process may be implemented by one of skill in the art in view of this disclosure.